REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Office Action dated September 14, 2007, the Notice of Appeal filed on December 14, 2007 and the telephone interview with the Examiners conducted on February 7, 2008. Applicants thank the Examiner and his Supervisor for taking the time to conduct the telephone interview.

The Examiner indicated that the claim amendments appear to overcome the prior art of record.

In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

As outlined above, claims 1, 3-5 and 7-21 stand for consideration in this application, wherein claim 1 is being amended to correct formal errors and to more particularly point out and distinctly claim the subject invention. New claims 20-21 are being added. All amendments to the application are fully supported therein. Applicant hereby submits that no new matter is being introduced into the application through the submission of this response.

Allowable Subject Matter

Claims 9-10, 12-13 and 19 would be allowable if rewritten into independent form to include the limitations of their base claim and any intervening claims.

Prior Art Rejections

Claims 1, 3-5, 7-8, 14 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over US Application No. 2002/0024153 A1 to Yoshida et al. in view of newly cited US Patent No. 6,452,215 to Sato and an article entitled "Asymmetric Multiple-Quantum-Well Heterostructures" by Kononenko. Claim 11 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshida '153, Sato '215 and Kononenko in view of US Patent No. 5,354,707 to Chapple-Sokol et al., claim 15 was rejected over Yoshida '153, Sato '215 and Kononenko in view of US Patent No. 6,394,655 to Hayashi, claim 16 was rejected over Yoshida '153, Sato '215 and Kononenko in view of US Patent No. 6,741,538 B2 to Momoo et al; and claim 17 was rejected over Yoshida '153, Sato '215 and Kononenko in

view of US Patent No. 5,625,729 to Brown. Applicant has reviewed the above-outlined prior art rejections, and hereby respectfully traverse.

The optical head of the present invention, as now recited in claim 1, comprises a light source for emitting a light beam, a lens for focusing the light beam onto a medium, and a detector for detecting a reflected light beam from the medium. The light source comprises a semiconductor laser comprising an active layer and a barrier layer, said active layer being formed of an indirect bandgap semiconductor in ***an asymmetric quantum structure*** (Figs. 6-7; pp. 21-23) in which a bandgap is defined between a quantum well of a conduction band 3 and an adjacent quantum well of a valence band 4, and each of the quantum wells has two walls which are asymmetric with respect to a center of the quantum well.

As recited in claims 21-22, the active layer is formed of a first layer constituting the quantum well of the conduction band and a second layer constituting the quantum well of the valence band, the first and second layers are made of different materials ("*an AlP layer having a thickness of 0.6 nm, which is an active layer and which serves as an electron side well, a GaP layer having a thickness of 0.6 nm, which serves as a hole side well*" p. 24, lines 13-17). For example, the first layer is made of AlP, the second layer is made of GaP, and said at least one barrier layer includes two barrier layers which are made of AlGaP and sandwich said active layer in-between.

The active layer of the present invention is more than an indirect semiconductor (i.e., the quantum well of a conduction band 3 is NOT aligned with an adjacent quantum well of a valence band 4 which form the bandgap as shown in Fig. 3), but an indirect semiconductor in "an asymmetric quantum structure" as shown in Figs. 6-7 (but not those in Figs. 4-5). Such "an asymmetric quantum structure" is defined in the specification. An inventor is allowed to be a lexicographer under MPEP §2111.01 to define his own terms. In addition, the "asymmetric quantum well structure" of the present invention is recited in claim 1.

A quantum well is a thin layer which can confine (quasi-)particles (typically electrons or holes) in the dimension perpendicular to the layer surface, while the movement in the other dimensions is not restricted. As shown in the annotated Fig. 6 (the invention), each of the quantum well (in broken lines) of a conduction band 3 and the adjacent quantum well of a valence band 4 is asymmetric with respect to a center of the quantum well due to their asymmetric well walls on both sides thereof (one high and one low; claim 20). In contrast, Fig. 4 shows a direct (rather than "indirect") bandgap structure with two symmetric quantum wells on two bands. A direct bandgap has the quantum well of a conduction band aligned with an adjacent quantum well of a valence band which form the bandgap. Each of Figs. 5A-

B shows an indirect bandgap structure with one symmetric quantum well on one band and two asymmetric quantum wells (with only one wall) on the other band, rather than "one asymmetric quantum well with two walls on each band" as the present invention.

The major feature of the present invention is the combination of the indirect bandgap semiconductor and the asymmetric quantum well structure having "one asymmetric quantum well with two walls on each band" (Figs. 6-7) with which a low coherent light source can be realized. The indirect bandgap semiconductor having an asymmetric quantum well structure enables light emission with an emission spectrum whose main peak has a half-width value in a relatively wide range. This coherent light source can reduce laser interference (variations in light quantity) of the optical head.

In contrast, Yoshida only mentions "an indirect transition semiconductor (p. 4, [0041])," but not any "asymmetric quantum structure" having "one asymmetric quantum well with two walls on each band" as the present invention.

As to Sato, Figs. 1b, 3, 8a, 11a only show indirect bandgaps, but not any indirect bandgap in an asymmetric quantum well structure having "one asymmetric quantum well with two walls on each band" as the present invention. On the other hand, Fig. 13 shows an indirect bandgap in the active layer (i.e., the quantum well of a conduction band is aligned with an adjacent quantum well of a valence band which form the bandgap).

Kononenko (e.g., Fig. 1) only show a plurality of direct bandgaps. The other cited references fail to compensate for the deficiencies as discussed above.

Applicants respectfully contend that none of the cited references or their combinations teaches or suggests the features recited in the independent claim 1 and new claims 20-21 as the present invention. As such, the present invention as now claimed is distinguishable and thereby allowable over the rejections raised in the Office Action. The withdrawal of the outstanding prior art rejections is in order, and is respectfully solicited.

Conclusion

In view of all the above, Applicant respectfully submits that certain clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references upon which the rejections in the Office Action rely. These differences are more than sufficient that the present invention as now claimed would not have been anticipated nor rendered obvious given the prior art. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and phone number indicated below.

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Annotated Drawings

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FIG. 5A

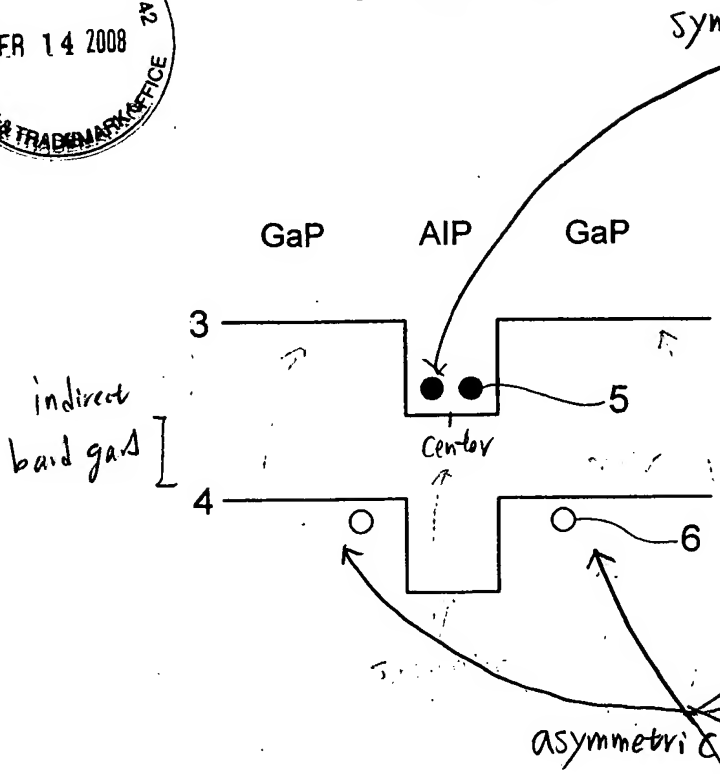

FIG. 5B

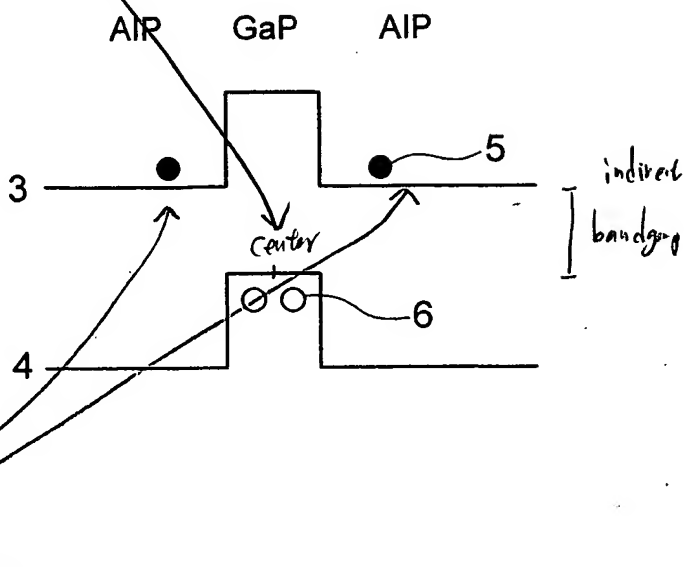

FIG. 6